TWO NEW SPECIES AND TWO NEW VARIETIES OF ALOE FROM MADAGASCAR.

By G. W. Reynolds.

(With Plates IV—X.)

At the invitation of Professor J. Millot, Director of the Institut Scientifique de Madagascar, I flew to Tananarive on 8th June, 1955, to study the Aloes of Madagascar. A Land Rover with driver was provided, and together with Mr. B. M. Descoings, the Institute's botanist, I travelled over 4,000 miles through the island, including the extreme south and the far north, investigating the Aloes. Several species were found at their recorded type localities, and many more elsewhere.

Distribution was recorded, descriptions were drawn up in the field, a large number of photographs was secured in colour and black and white, while much herbarium material was carefully prepared. This material has been contributed to Tananarive and Paris, with duplicates for Pretoria and Kew, together with complete sets of photographs.

As a result of this expedition which, fortunately, was very successful, and at Professor Millot's invitation, I hope to attempt an illustrated review of the Aloes of Madagascar soon.

In the meantime, two new species and two distinctive varieties await description, and they are now described with the full concurrence of Professor H. Humbert, Director of the Natural History Museum, Paris.

Aloe Millotii Reynolds, species nova in subsect. *Prolongatae*, ser. *macrifoliae* Berger; *A. antandroy* H. Perrier et *A. Bakeri* Scott Elliot affinis.

Planta succulenta. *Caules* decumbentes vel adscendentes, graciles, elongati, 7—9 mm. diam., 20—25 cm. longi, e basi ramosi, apice per 5—7 cm. sublaxe foliati. *Folia* 8—10, patentia, recurvula, carnosula, 8—10 cm. longa, 7—9 mm. lata; *supra* viridia, rubescentia, saepe immaculata, canaliculata; *subtus* convexa, maculata; dentibus marginalibus deltoideis, albidis, ·5—1 mm. longis, 5—10 mm. inter se distantibus armata. *Inflorescentia* simplex, 12—15 cm. longa. *Pedunculus* gracilis, superne bracteatus, bracteae vacuae ovato-acuminatae, scariosae, albidae, 8 mm. longae, 5 mm. latae. *Racemi* laxe 6—8-floribus, 4—5 cm. diam. *Bracteae* ovato-acutae, infimae 7 mm. longae, 4 mm. latae, scariosae, 3—5-nervatae. *Pedicelli* 6—8 mm. longi. *Perigonium* coccineum, 22 mm. longum, circa ovarium 7 mm. diametro, hinc levissime constrictum et decurvulum, fauces versus levissime ampliatum; *segmenta exteriora* libera.

Antherae 1 mm. exsertae. *Stigma* demum 1—2 mm. exserta. *Ovarium* 5 mm. longum, 2 mm. diametro. (Plates IV—VI.)

Habitat: Madagascar: Cap Ste. Marie, xerophytic bush and limestone plateaux, alt. 100—150 met., fl. 22 Feb., 1947, Humbert 20342! (P); on limestone at Cap Ste. Marie, *c* 23° 35′ S., 49° 05′ E., alt. 100 met., fl. 5 July, 1955, Reynolds 7840, holotype (TAN), isotype (P, K, PRE).

A. Millotii was collected by Professor H. Humbert (n. 20342) at Cap Ste. Marie, the southernmost point of Madagascar in 1946, and was provisionally named after Professor J. Millot. Plants were sent to the gardens at Tzimbazaza, Tananarive, for cultivation, but a description could not be drawn up without adequate flowering material.

Accompanied by Mr. B. M. Descoings, the Institute's botanist, I visited Cap Ste. Marie on 5 July, 1955, and had the good fortune to find a considerable number of plants growing there on Eocene limestone, many being in flower. A description was drawn up, photographs were secured, and sufficient herbarium material was prepared. This very distinctive species can now be described and I am happy to adopt the name under which it has been known for some years.

A. Millotii was found only on limestone, in exposed places or in partial shade, under intensely arid conditions. Plants form very small low undershrubs which are much-branched at the base, the outer stems being mostly decumbent with the centre ones erect to sub-erect. When partly supported by low twiggy bush, stems may reach 50 cm. in length with 16—20 leaves laxly grouped along the apical 20 cm. of stems. In exposed positions, stems average 20—25 cm. long with the apical 5 cm. sub-densely foliate.

Leaves are at first distichous in young stems, but become spirally twisted to rosulate with age. Marginal teeth vary from smaller to larger and are sometimes obsolescent near apex. Racemes are few-flowered, and only 2—4 simple inflorescences were noticed in a much-branched plant. The inflorescences vary from oblique to arcuate-ascending and suberect. Outer segments are free to base, but cohere in lower half.

In pedicels, and shape and size of flowers, *A. Millotii* is scarcely separable from *A. antandroy* H. Perrier—which I found between Cap Ste. Marie and Tsihombe, also west of Tsihombe and near La Table, Tulear—but the latter is a much larger plant with rigid erect stems 50 cm.—1 m. long, and very different leaves.

A. Bakeri Scott Elliot, which I found near Fort Dauphin, is a near ally, but differs in forming large very dense groups of 50—100 plants, and in having somewhat ventricose flowers which shade from apricot-orange at base through orange to yellow at the green-tipped mouth.

A. Millotii is a very distinctive species with a rather sprawling habit of growth, and could hardly be confused with any other species.

DESCRIPTION: A small low undershrub, much branched at base.

Stems decumbent, divergent or ascending, averaging 20—25 cm. long in exposed positions, 7—9 mm. diam. near base, slightly thicker upwards, 10—20-branched from base or higher, the apical 5—7 cm. sublaxly to sub-densely foliate with the internodes 5—10 mm. apart.

Leaves 8—10, spreading to recurved, distichous in young shoots, becoming spirally twisted to rosulate with age, basally sheathing, 8—10 cm. long, 7—9 mm. broad at base, gradually tapering to the apex which is obtusely rounded and armed with about 5 rather soft white cartilaginous prickles about ·5—1 mm. long; *upper surface* dull grey-green with reddish tinge when in full sun, greener in partial shade, canaliculate, with or without a few small dull white spots low down; *lower surface* convex, usually greener than upper surface and with many scattered dull white spots throughout, the spots about 2 mm. long, 1—1·5 mm. broad at the middle, sometimes minutely subspinulescent; *margins* armed with small, white, cartilaginous, deltoid, isolated teeth ·5—1 mm. long, 5—10 mm. distant, the inter-spaces straight and the colour of the leaf, sometimes obsolescent near apex.

Inflorescence always simple, averaging 12—15 cm. long.

Peduncle plano-convex and 3—5 mm. broad at base, terete upwards, about 3 mm. diam. below the raceme, with about 5 sterile-bracts in upper half, the lowest ovate-acuminate, thin, scarious, white, about 8 mm. long, 5 mm. broad at base, many-nerved, smaller upwards.

Racemes laxly 6—8-flowered, 4—5 cm. diam., the pedicellate portion 3—5 cm. long, the scarlet buds grey-green tipped, spreading, open flowers nutant to sub-pendulous.

Bracts ovate-acute, the lowest 7 mm. long, 4 mm. broad at base, reflexed, thin, scarious, 3—5-nerved.

Pedicels spreading, averaging 6—8 mm. long.

Perianth scarlet, paler at mouth, averaging 22 mm. long, basally flat to very slightly rounded, 7 mm. diam. across the ovary, constricted to 6 mm. above the ovary, thence slightly decurved and enlarging to the throat with the mouth wide open; *outer segments* free to base but cohering to the middle, obscurely 3-nerved, the nerves green at apex, the apices subacute, slightly spreading; *inner segments* free, thin and white at the edges, with a scarlet keel turning greenish at apex, the apices more obtuse and more spreading than the outer.

Filaments almost white, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1 mm.

Style pale lemon, with *stigma* at length exserted 1—2 mm.

Ovary pale orange-yellow, 5 mm. long, 2 mm. diam., truncate at apex. *Capsule* round-oval, 15 mm. long, 12 mm. diam.

NATIVE NAME: *Vaotsay.* The natives make a decoction from the leaves and drink it for stomach troubles.

A. bulbillifera H. Perrier var. **Paulianae** Reynolds. Varietas nova, a forma typica bulbillis epipedunculis, infra ramos non epiramis geruntibus differt. (Plates VII, VIII.)

Habitat: Madagascar: Majunga Province, ex 85 km. south-west of Antsohihy, *c.* 15° 03′ S., 47° 44′ E., alt. 100 met., coll. Madame L. Paulian, cult. Tzimbazaza, fl. 9 June, 1955, Reynolds 7656 holotype (TAN), isotype (P, K, PRE); 85 km. south-west of Antsohihy, 20 July, 1955 (bulbils only), Reynolds 7904 (TAN, P, K, PRE).

This distinctive variety was first collected by Madame L. Paulian, wife of Dr. R. Paulian, Deputy Director of the Institut Scientifique de Madagascar. Plants were cultivated in the Institute's gardens at Tzimbazaza, Tananarive, where I saw some in flower on 9 June, 1955, together with the typical form that was also flowering.

Subsequently, on 20 July, 1955, while travelling northwards to Diego Suarez, I found considerable numbers of the variety on rocky slopes, on a ridge above forest, at a point 24 km. south of the Analalava road junction and 85 km. south-west of Antsohihy. Capsules had dehisced and were then very dry, but the bulbils were well developed on the peduncle below the branches.

In the typical form of *A. bulbillifera* (Plate VII, Fig. 1), the inflorescence is taller, considerably more branched from below the middle, the branches are very much longer, while the peduncle is more slender, and unable to support the weight of the inflorescence which bends over sideways. Bulbils form only on the slender branches below the racemes and develop after the flowers are over.

In the var. *Paulianae* (Plate VII, Fig. 2), the peduncle is stouter, erect or suberect, rigid, and is branched only in the upper quarter, the branches being considerably shorter and much more compact. Bulbils form only on the peduncle from about the middle to the lowest branch or a little higher, and not on the branches. These sessile bulbils commence developing when the flowers open. When the capsules dehisce and become very dry, the bulbils comprise rosettes of 4—6 leaves which are up to 5 cm.

long, 15 mm. broad, with dentate margins. When the peduncle dries out, the bulbils drop and root. There is little difference in leaf characters, bracts, pedicels and flowers.

DESCRIPTION: Plant succulent, acaulescent, solitary.

Leaves about 24, densely rosulate, lanceolate-attenuate to ensiform, spreading, about 60 cm. long, 9 cm. broad at base; *upper surface* dull green with reddish tinge, without spots or markings, slightly canaliculate; *lower surface* convex, greener, without spots or markings; *margins* sinuate-dentate, armed with firm, compressed-deltoid, dull white teeth 3 mm. long, 12 mm. distant, the teeth slightly forward-uncinnate. *Sap* dries yellow.

Inflorescence a branched panicle up to 2 m. high, 2—4 simultaneously.

Peduncle basally plano-convex and 15—20 mm. broad, brown with a bloom, branched in upper quarter, with about 12 compact arcuate-ascending branches, the lowest 2—3 branches with 1—3 branchlets; the peduncle developing sessile bulbils below the first branch and not on the branches, the bulbils at length comprising rosettes of about 5 leaves which are thick, fleshy, spreading to recurved, 5 cm. long, 15 mm. broad, with dentate margins.

Racemes cylindric-acuminate, sublaxly flowered, the terminal 25—30 cm. long, 6 cm. diam., branch racemes 15—20 cm. long, buds spreading to nutant, open flowers subpendulous.

Bracts ovate-acute, 4 mm. long, 3 mm. broad, thin, scarious, 3—5-nerved.

Pedicels slender, reddish-brown, 8—10 mm. long, suberect to spreading.

Perianth scarlet, paler at mouth, sub-cylindric, 27 mm. long, basally flat, 7 mm. diam. across the ovary, thence very slightly narrowed on the underside and slightly decurved, enlarging towards the throat; *outer segments* free to base but cohering to the middle, apices subacute, slightly spreading; *inner segments* free, broader than the outer, with 3 crowded nerves forming a scarlet keel, apices more obtuse and more spreading than the outer.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their anthers in turn exserted 2 mm.

Style pale lemon, with stigma at length exserted 3—4 mm.

Ovary pale olive, 5 mm. long, 2 mm. diam., obtuse at apex.

A. acutissima H. Perrier var. **antanimorensis** Reynolds var. nov. in Sect. *Prolongatae* ser. *macrifoliae* Berger. A forma typica plantis humilioribus, caulibus brevioribus gracilioribus, folii angustioribus brevioribus, pedicellis et floribus brevioribus differt; *A. Decaryi* Guillaumin et *A. antandroy* H. Perr. affinis. (Plate V.)

Habitat: Madagascar: Tulear Province, 8 km. north-west of Antanimora, *c.* 24° 44′ S., 45° 36′ E., alt. 300 met., fl. 28 June, 1955, Reynolds 7792 holotype (TAN), isotypes (P, K, PRE).

Large numbers of flowering plants were found on 28 June, 1955, on flat rock surfaces among thorn bushes and tall stemmed Pachypodiums, 8 km. north-west of Antanimora, at km. 313 on the main road from the north to Ambovombe and Fort Dauphin. Plants are of low shrubby growth and form dense patches 1—2 met. and more across.

The var. *antanimorensis* differs from typical *A. acutissima* in having much shorter stems which are only 6—9 mm. in diameter, against 20—30 mm. The leaves are shorter and only 15—20 mm. broad at base, while pedicels average 10 mm. long against 15—20 mm. The flowers are 25 mm. long against 30—35 mm. in the typical form. A noteworthy character of the variety is that the inflorescence is as tall as the stem and rosette combined, sometimes taller.

A species to be considered is *A. Decaryi* Guillaumin—which I did not succeed in finding. This species is described as having leaves only 8—9 mm. broad, pure white marginal teeth, scape as long as the leaves (i.e., 15—19 cm.), and perianth outer segments free to base. In our new variety, apart from other differences, the lower half of the perianth is a definite tube.

A. antandroy H. Perr. is another ally, but this species has much longer subscandent stems, considerably narrower spotted leaves, and very differently shaped flowers.

DESCRIPTION: *Plant* succulent, of low broad shrubby growth.

Stems 30—50 cm. long, 6—9 mm. diam., branched at base, the apical 10—15 cm. sublaxly about 10-foliate, the internodes 10 mm. distant, striate.

Leaves about 10, basally sheathing, narrowly lanceolate-attenuate, spreading, 15—20 cm. long, 18—20 mm. broad at base; *upper surface* dull grey-green, unicoloured, flat to slightly canaliculate; *lower surface* convex, similar to upper surface; *margins* armed with deltoid, firm, pale brownish teeth 2 mm. long, averaging 8 mm. distant.

Inflorescence simple or sometimes with a short branch, 40—50 cm. tall.

Peduncle slender, basally plano-convex and 5—7 mm. broad, terete upwards, brown, with about 6 sterile-bracts, the bracts deltoid, thin, scarious, up to 12 mm. long, 5 mm. broad, many-nerved.

Racemes cylindric-conical, 8—10 cm. long, sub-densely flowered, youngest buds suberect and partly obscured by their bracts, older buds spreading, open flowers subpendulous.

Bracts narrowly deltoid, the lowest 12 mm. long, 3 mm. broad at base, thin, scarious, about 7-nerved.

Pedicels 10 mm. long.

Perianth reddish-scarlet, 25 mm. long, obtusely tapering at base to the pedicel, 5 mm. diam. across the ovary, very slightly constricted above the ovary, thence slightly decurved and enlarging towards the throat, the mouth open, trigonous; *outer segments* free for half their length, obscurely 5-nerved, apices sub-acute slightly spreading; *inner segments* free but dorsally adnate to the outer for half their length, broader than the outer, with thin pale borders, keeled in upper half, the apices more spreading than the outer.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1 mm.

Stigma at length, exserted, 2 mm.

Ovary olive-brown, 4 mm. long, 2 mm. diam., the apex truncate.

Aloe itremensis Reynolds, spec. nov., nulli alii arcte affinis, forsitan sectionem propriam constituere debet.

Planta succulenta, acaulescens vel brevissime caulescens.

Folia 12—16, rosulata, patentia, usque ad 30 cm. longa, 4·5 cm. lata, sensim attenuata; *supra* viridia, rubescentia, immaculata, leviter canaliculata; *subtus* convexa; ad margines dentibus deltoideis, parvis, 1—1·5 mm. longis, 5—8 mm. distantibus armata.

Inflorescentia gracilis, 2–3-ramosa, 1–1·20 met. alta. *Racemi* cylindrico-acuminati, 15—20 cm. longi. *Bracteae* anguste deltoideae, 6 mm. longae, 2 mm. latae, subscariosae, 3-nervatae. *Pedicelli* 8—9 mm. longi. *Perigonium* rubrum, anguste cylindrico-clavatum, 25 mm. longum, circa ovarium 5 mm. diametro, hinc levissime ampliatum; *segmenta exteriora* libera, 5-nervata, interiora angustiora. *Genitalia* demum 1 mm. exserta. *Ovarium* 4·5 mm. longum, 2 mm. diametro. (Plate X.)

Habitat: Madagascar, on the Itremo range, 54 km. west of Ambatofinandrahana, *c.* 20° 37′ S., 46° 34′ E., alt. 1,700 met., fl. 20 June, 1955, Reynolds 7706, holotype (TAN), isotype (P, K, PRE).

A. itremensis was found on the western side of the plateau along the top of the Itremo range at a point on the roadside 54 km. west of Ambatofinandrahana, and 94 km. west of Ivato, on the road to Amborampotsy and Morondava, at an altitude of 1,700 met., and at approximately 20° 37′ S., 46° 34′ E.

Plants were noticed only on steep sandstone slopes and outcrops, usually in exposed positions, but sometimes in shade.

Professor Millot confirms that plants did not fit any published description, and I am naming the species after the only locality where I found it.

A. itremensis occurs as solitary plants not forming groups. It has little or no stem, and is characterised by its very small marginal teeth, slender tall inflorescence which is compactly only 2—3-branched from the middle or higher, and by its very narrowly deltoid bracts.

DESCRIPTION: Plant succulent, solitary, not forming groups.

Stem 0—20 cm. long, up to 3 cm. diam.

Leaves 12—16, rosulate, arcuate-ascending, spreading to recurved in upper quarter, up to 30 cm. long, 4·5 cm. broad at base, gradually tapering to an acute apex; *upper surface* basally flat, slightly canaliculate upwards, dull-green with reddish tinge, without spots or markings; *lower surface* convex, similar in colour to upper surface; *margins* armed with broadly compressed-deltoid brownish teeth which are paler at apex, 1—1·5 mm. long, 5—8 mm. distant, larger near base, smaller upwards, obsolescent towards apex.

Inflorescence a slender 2—3-branched panicle 1—1·20 met. high.

Peduncle plano-convex and 14 mm. broad at base, terete upwards, brown with a bloom, compactly 2—3-branched from the middle or higher.

Racemes cylindric-acuminate, the terminal averaging 15—20 cm. long, the lateral a little shorter, the buds suberect, older buds spreading, open flowers subpendulous, all unicoloured reddish-scarlet.

Bracts narrowly deltoid, 6 mm. long, 2 mm. broad at base, reflexed at the middle, thin, subscarious, with 3 crowded nerves sometimes appearing as 1-nerved.

Pedicels reddish-brown, 8—9 mm. long, slender.

Perianth narrowly cylindric-clavate, averaging 25 mm. long, tapering at base into the pedicel articulation, 5 mm. diam. across the ovary, enlarging a little to the throat and slightly contracted at the mouth; *outer segments* free to base, with pale thin edges, obscurely 5-nerved throughout, the apices sub-acute, slightly spreading; *inner segments* free, slightly narrower than the outer, 5 mm. broad in upper two-thirds with thin white 2 mm. broad border, prominently scarlet-keeled, the apices more obtuse than the outer.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 1 mm. *Stigma* at length exserted 1 mm.

Ovary pale olive, 4·5 mm. long, 2 mm. diam., obtusely tapering into the style and faintly 6-striped longitudinally.

ACKNOWLEDGMENTS.

I am greatly indebted to Professor J. Millot, Director of the Institut Scientifique de Madagascar, Tananarive, for his invitation to study the Aloes in Madagascar, and for providing every possible facility and assistance during my visit.

To Dr. R. Paulian, the Deputy Director, I am obliged for arranging transport throughout the Island, and for considerable help in many other directions.

I am grateful to the Institute's botanist, Mr. B. M. Descoings for much considerate help and many kindnesses during seven weeks of continuous travelling together.

I am also indebted to the South African Council for Scientific and Industrial Research for a travelling grant which enabled me to fly to Madagascar to investigate the Aloes.

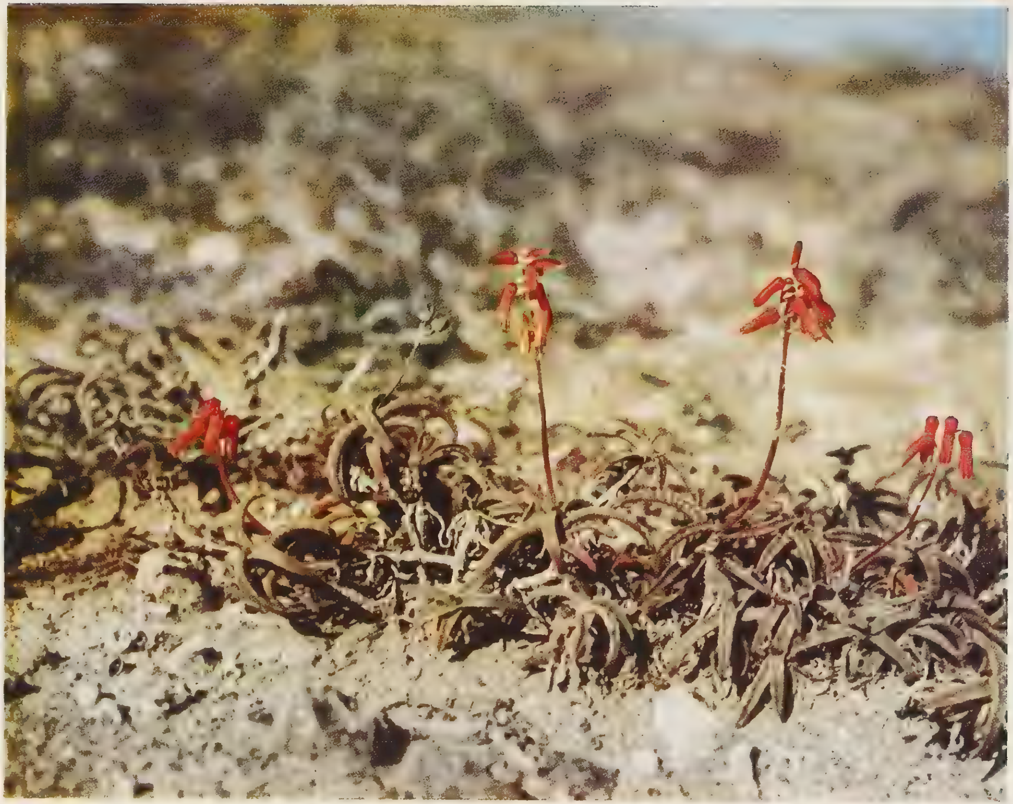

PLATE IV. *Aloe Millotii* Reynolds.
On limestone at Cap Ste. Marie, Madagascar.
Fl. 5 July, 1955. Height 20 cm.

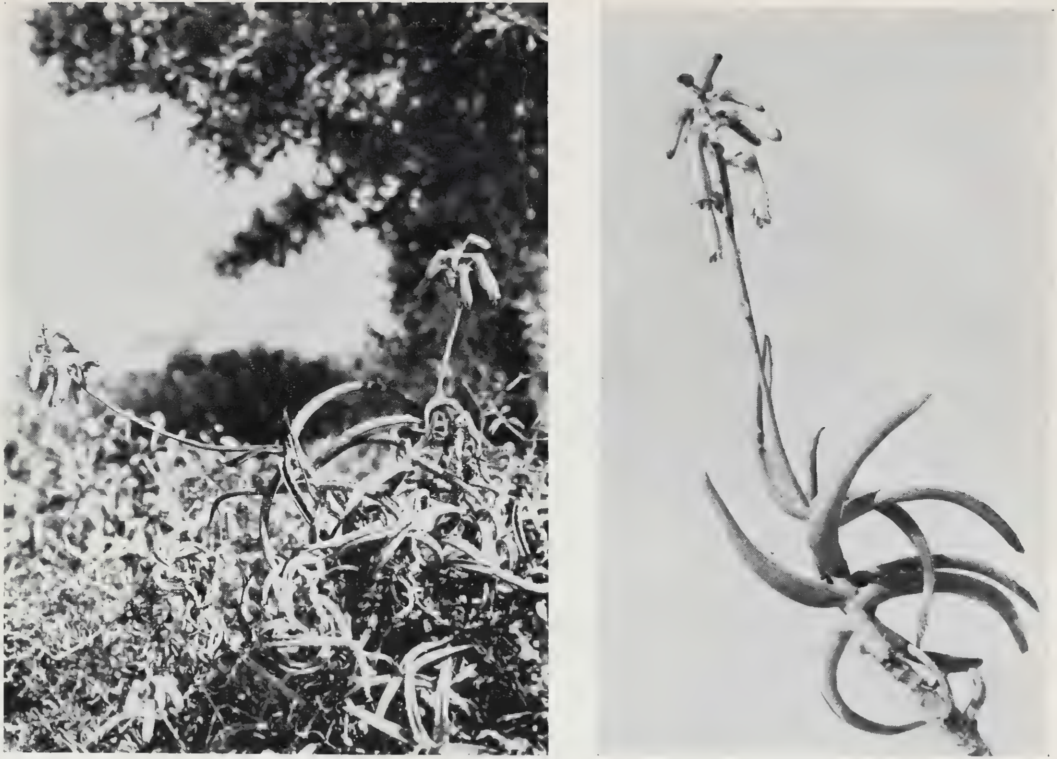

Fig. 1. Fig. 2.

Plate V. *Aloe Millotii* Reynolds.

Fig. 1. Plant in partial shade at Cap Ste, Marie, the southernmost point of Madagascar. Fl. 5 July, 1955. $\frac{1}{4}$ approx.
Fig. 2. Flowering stem × $\frac{1}{2}$ approx.

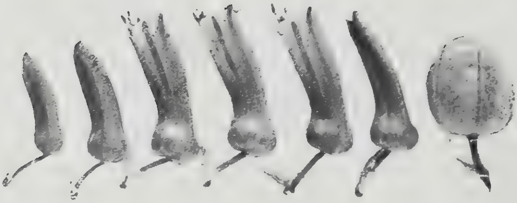

Fig. 1.

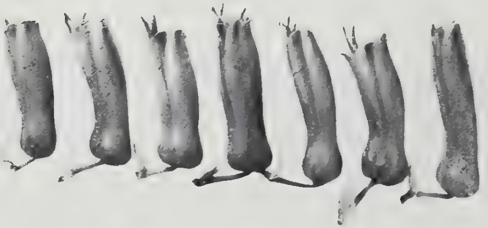

Fig. 2.

Plate VI. *Aloe Millotii* Reynolds.

Fig. 1. Flowers 1/1 from bud to fruit.
Fig. 2. Various flowers 1/1 showing variation.

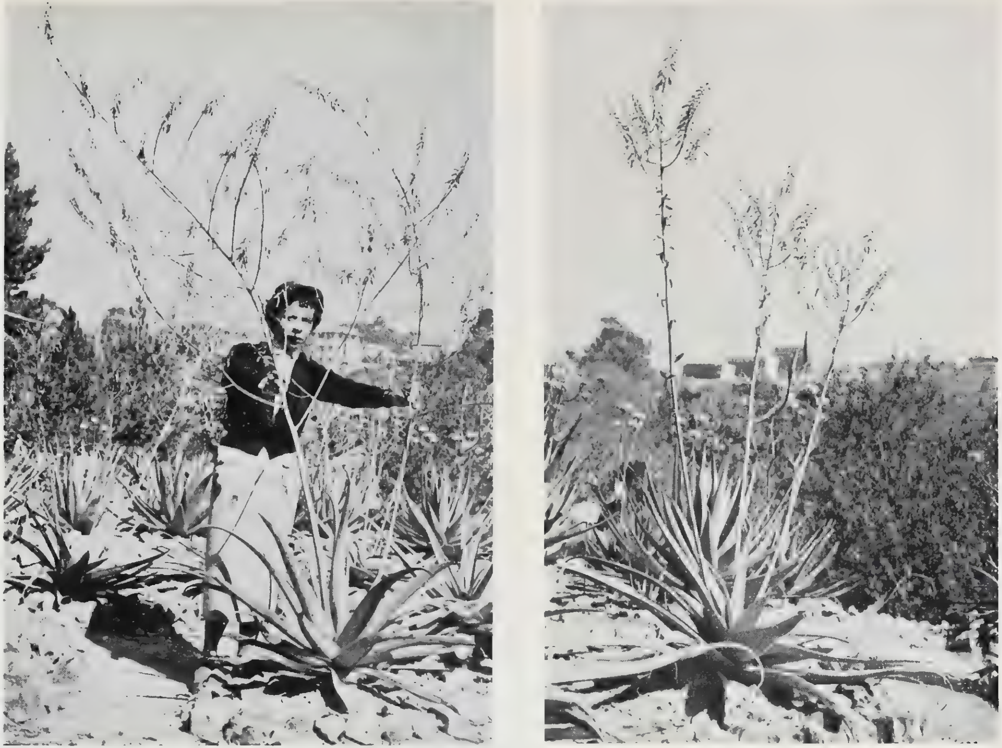

FIG. 1. FIG. 2.

PLATE VII.

FIG. 1. *Aloe bulbillifera* H. Perrier, typical form, published for comparison. Fl. 9 June, 1955 at Tzimbazaza, Tananarive; the sprawling inflorescences held up by Mademoiselle Genoud, for clearer detail.

FIG. 2. *A. bulbillifera* H. Perrier var. *Paulianae* Reynolds. Forms bulbils on the peduncle and not on the branches. Fl. 9 June, 1955 at Tzimbazaza.

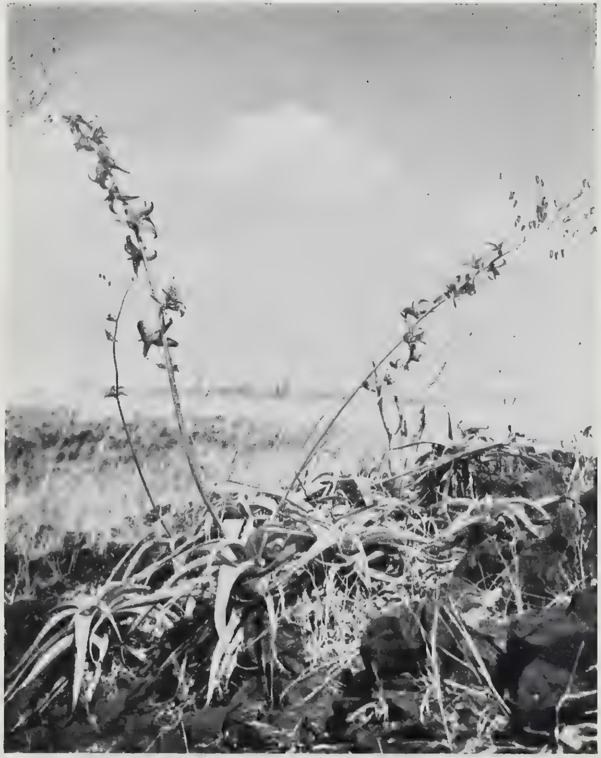

Fig. 1.

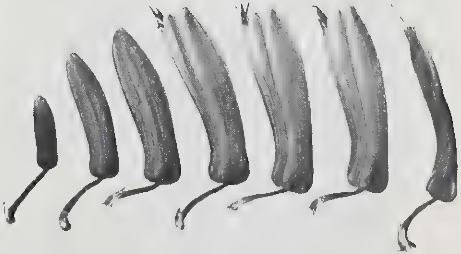

Fig. 2.

Fig. 1. Plants in natural habitat, 85 km. south-west of Antsohihy, Majunga Province, Madagascar. Capsules very dry and bulbils well developed. 20 July, 1955.

Fig. 2. Flowers 1/1 from bud to post-pollination stage, from a plant in the gardens at Tzimbazaza, Tananarive. Fl. 9 June, 1955.

Plate VIII. *A. bulbillifera* H. Perrier var. *Paulianae* Reynolds.

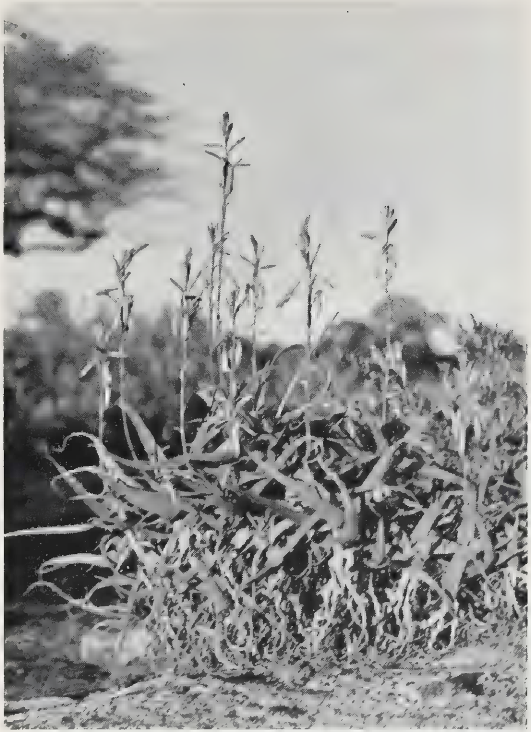

Fig. 1.

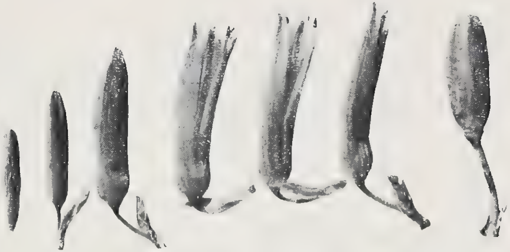

Fig. 2.

Fig. 1. Plants in natural habitat, 8 km. north-west of Antanimora, Southern Madagascar. Fl. 28 June, 1955. × $\frac{1}{8}$ approx.

Fig. 2. Flowers 1/1 from bud to fruit stage.

Plate IX. *Aloe acutissima* H. Perrier var. *antanimorensis* Reynolds.

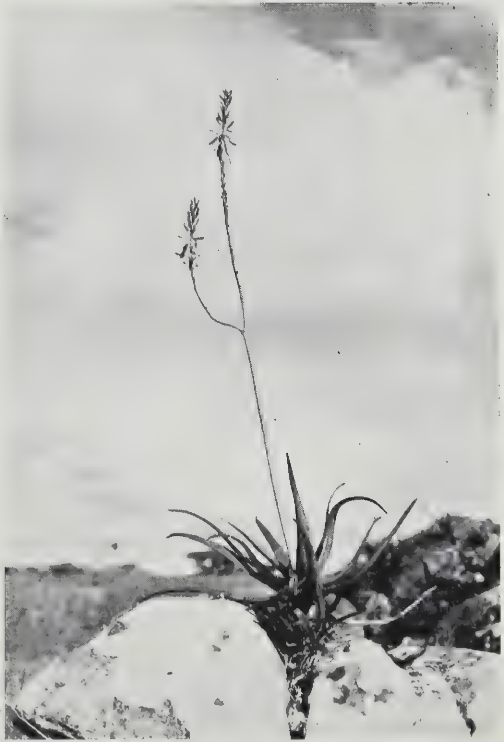

FIG. 1.

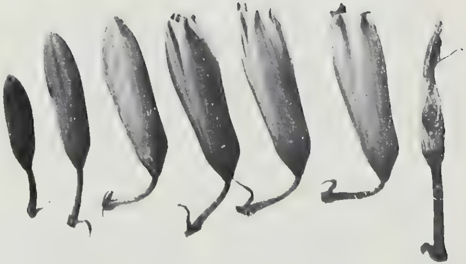

FIG. 2.

FIG. 1. Plant in natural habitat, on the Itremo range, 54 km. west of Ambatofinandrahana, Madagascar. *c.* 20° 37′ S., 46° 34′ E. Height 1·2 met.

FIG. 2. Flowers 1/1, from bud to post-pollination stage.

PLATE X. *Aloe itremensis* Reynolds.